

WHAT IS CLAIMED:

1. A method for the detection and differentiation of biological material comprising:
 - a. exciting at least one intrinsic biological fluorophore having a specific excitation range of electromagnetic radiation wavelength above 200 nm; whereby said intrinsic fluorophore in the biological material is excited to emit fluorescence; and
 - b. detecting the signal intensities associated with the minima and maxima of the intrinsic fluorescence; and
 - c. detecting the background intensities at the minima and maxima of the intrinsic fluorescence in the absence of excitation; and
 - d. calculating the intensities of the reflectance and scattering at the maxima of the fluorescence from the intensities of the background-subtracted minima with an appropriate algorithm; and
 - e. subtracting the calculated reflected and scattered signal intensities and measured background intensities from the detected signals of the biological fluorescence; thereby determining the amount of material by the magnitude of the detected fluorescence from which background, reflectance, and scattering contributions have been subtracted.
2. The method as set forth in Claim 1, wherein the ratios of multiple fluorescence signal intensities, from which measured background and calculated reflectance and scattering have been subtracted, are determined; whereby the differentiation between the biological material depends upon the requirement that the ratios of

the background, scattering, and reflectance-corrected fluorescence signals lie within specified ranges and that the amount of material is determined by the magnitude of said detected signals the ratios of which lie within said expected ranges.

3. The method as set forth in Claim 1, wherein said biological intrinsic fluorescence are selected from the group fluorescing in the 320-360, 380-460, 430-480, 420-510, 430-540, 480-570, 630-700, 760-840 and 860-930 nm regions.
4. A method for the detection and differentiation of biological material comprising:
 - a. exciting multiple intrinsic biological fluorophores with ultraviolet electromagnetic radiation having excitation wavelengths between 200 and 300 nm, whereby intrinsic fluorophores in any biological material present are excited to emit fluorescence, some of which is self-absorbed to excite other intrinsic fluorophores that in turn emit fluorescence; and
 - b. detecting the fluorescence signal intensities associated with the minima and maxima of the intrinsic fluorescence; and
 - c. detecting the background intensities at the minima and maxima of the intrinsic fluorescence in the absence of excitation; and
 - d. calculating the intensities of the reflectance and scattering at the maxima of the fluorescence from the intensities of the background-subtracted minima with an appropriate algorithm; and
 - e. subtracting the calculated reflected and scattered signal intensities and measured background signal intensities from the detected signals of the biological fluorescence; and

- f. determining that the ratios of the detected fluorescence signals from which background, reflectance, and scattering contributions have been subtracted lie within expected ranges, thereby determining the amount of biological material by the magnitude of the detected fluorescence signals from which background, reflectance, and scattering contributions have been subtracted the ratios of which lie within expected ranges.
5. The method as set forth in Claim 4, wherein the intrinsic biological fluorophores of said biological intrinsic fluorescence are selected from the group fluorescing in the 320-360, 380-460, 430-480, 420-510, 430-540, 480-570, 630-700, 760-840 and 860-930 nm regions.
6. The method as set forth in Claim 4, wherein secondary-excited intrinsic fluorescence includes the 430-480, 420-510, 430-540, 480-570, 630-700, 760-840 and 860-930 nm regions, and the like.
7. A method for the detection, differentiation and imaging of biological material comprising:
 - a. exciting at least one intrinsic biological fluorophore having a specific excitation range of electromagnetic radiation wavelength above 200 nm; whereby said intrinsic fluorophore in the biological material is excited to emit fluorescence; and
 - b. detecting and imaging the signal intensities associated with the expected maximum emission ranges of the intrinsic fluorescence of the biological material in question; and

- c. imaging the substrate background with ambient light, reflected excitation radiation and scattered excitation light at wavelengths at least 50 nm above the highest expected emission wavelength range of the intrinsic fluorescence; and
 - d. combining the output images of the intrinsic fluorescence emission ranges and the substrate surface from ambient light, reflected excitation radiation and scattered excitation light at wavelengths at least 50 nm above the highest expected emission wavelength range of the intrinsic fluorescence; thereby detecting the biological material by the presence of lower wavelength images upon higher wavelength substrate surface image; and
 - e. differentiating between biological material samples by requiring that the ratios of detected intrinsic fluorescence emissions fall within expected ranges, and determining the amount of material by the magnitude of the detected fluorescence.
8. Apparatus for the detection of biological material on a non-living surface comprising:
- a. means for directing electromagnetic radiation towards the sample, said means adapted to emit radiation at energies capable of exciting at least one intrinsic biological fluorophore;
 - b. at least one detector for electromagnetic radiation capable of converting the emitted, or reflected and scattered radiation into electrical signals, said detector adapted to detect electromagnetic radiation at wavelengths above

- 320 nm to detect the minima and maxima associated with the fluorescence emission of said intrinsic biological fluorophores; and
- c. means for analyzing the electrical signals corresponding to the fluorescence of the intrinsic fluorophores, and the reflected and scattered excitation intensities to determine the presence of biological material.
9. The apparatus as defined in Claim 8, wherein the electromagnetic waves are directed towards the substrate surface in time-modulated pulses.
10. The apparatus defined in Claim 8, wherein the means for directing electromagnetic radiation includes means for time-modulating the electromagnetic radiation.
11. The apparatus defined in Claim 8, wherein the means for directing electromagnetic radiation includes means for sequentially directing the electromagnetic radiation towards the sample surface.